THE FUTURE OF SURGERY

WITHOUT LIMIT.

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President of the American Surgical Association.

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FELLOWS OF THE AMERICAN SURGICAL ASSOCIATION:

I believe that we are warranted in saying that the future of surgery is without limit. I deduce this conclusion, first, from considering what the mind of man has already done; second, from the future possibilities of fields hitherto unknown and unexplored, but now opening up to science. There can be but two limitations, either in the mind of man or in the subject.

Since the time when, in the anthropoid, the cerebral lobes first began to creep over and cover the cerebellum, what a growth has taken place in the penetrating power of the human senses. The brain has progressed from the rude hammer of the prognathous cave dweller to the telescope and the microscope. Originally of vision far less acute than the eagle's, the eye of man now ranges from the fixed star to the 20,000th of an inch bacteria. We analyze the sun's gases with the spectrum; we follow the magnet unerringly on the sea; we utilize the lightning; we count the vibrations of sound; we

measure light; we speak across the ocean; we estimate the age of our planet; we analyze atoms; we compose new substances; we make pictures from light; we photograph and map the stars; we explore the pole and test the glacial history of the world; we find subterranean springs, and light our homes from old volcanic sources; we measure the crevasses in the glaciers of Mars; we count tides by the moon; we defy the wind with steam; we foretell storms by the barometer; we construct isothermal lines; we inspect the bottom of the sea; we demonstrate eclipses; we measure space by the transit of Venus; we predict comets; we find a solar and a stellar unit of time; we unravel Egyptian chronology; we trace man downward through the stages of evolution. Man invents the wheel; the ship; the pendulum; the siphon. Under the water, in and on the earth; in the air; in the infinity of space; in the infinity of micro-organisms,— the mind finds no limit, but is ever restless, ever searching. And now in medicine averting pestilence; annulling pain; destroying sepsis; shall we stop?

In gradual development the brain of man has gone on step by step, investigating itself, until we localize disease by the tracings on cerebral surfaces, and condense in that wonderful cortical substance a palimpsest of impressions, mental and material. The brain studies itself. "Know thyself," said the Greek; and in searching the crypts of the human brain we may well echo the description of the greatest of the sons of men, "How noble in reason!

How infinite in faculties! In apprehension, how like a God!"

We pass now to the second limitation, in the subject itself. Long since was it said that all was found out in anatomy, and that surgery had nearly reached its limit. Far from this, the microscope has created a new anatomy and a new pathology; physiology changes yearly; the lower animals yield light by the Baconian test of experiment. Anæsthesia enlarged surgery; antisepsis emboldens surgery; and we can set no limits to the advance.

The three sacred cavities; the abdomen, which means hidden; the thorax, which holds two feet of the tripod of life; the skull, which conceals the nerve force, the vital principle, all are explored.

Medicine, always obscure, is growing clearer; and instruments of precision have been applied to our art. The clinical thermometer is the tell-tale of internal changes, inflammatory or septic. What have we to fear? We advance haltingly, but we advance.

Specialism exhausts minute localities; by its occasional discoveries enlightens medicine; by its failure calls sometimes a halt. Specialism, tempered by general medicine, becomes a safe companion in our march onward.

It becomes us soberly to inquire how to study the new seats of surgical exploration. What new methods are needed? Where must we be conservative? Where can we be bold?

Since medicine is composed of a science and an art, we must study the science to develop the art. The four pure sciences are Anatomy, Physiology, Chemistry, Pathology. These purely scientific portions of our profession are the only ones that can yield positive knowledge, and this only by dissections, experiments, and analyses.

Modern surgery deals with anatomical regions hitherto insufficiently studied. First, the *fasciæ*; the linings and bindings of the muscles, vessels, and nerves, have great influence in determining the course of suppuration and the size and locality of abscesses. A perfect dissection and preparation of the fasciæ does not exist. It is, perhaps, impossible to make it. Frozen sections and their photographs give the best idea of the relations of the fasciæ. Familiar instances of the importance of the arrangement of the fasciæ are to be found in the psoas sheath; the saphenous opening; the triangular ligament of the perineum; the deep cervical fascia; the fascia lata; the fascia of the forearm and the annular ligament; the posterior ligament or fascia of Winslow in the popliteal space.

Next, the topographical anatomy of the viscera, especially in the abdomen; not only the variations in the reflexion of the peritoneum, but the mobility of the organs; the rhythmic changes produced by respiration on the veins, on the diaphragm as an agent of displacement; and on the pelvic diaphragm, the perineum; the incessant movements of peristalsis and its power to change the locality of organs,

—all these have not been sufficiently considered by the diagnostician and by the operator. Normal splanchnology and frozen sections of the abdominal cavity are of more worth to the student than the mnemonics of the origin of all the muscles and the twigs of all the arteries. The exact relations of the mediastina to the œsophagus, aorta, pericardium, and pleural cavities are of great importance also.

No less directly useful is an exhaustive and minute topography of the brain; the bearings of the falx, tentorium, corpus callosum, ventricles, the centre of decussating fibres; the ultimate origin of the fibres of the cranial nerves; the sinuses; the relations of the middle ear; the petrosal sinuses; the mastoid cells and their variations; the fissures of Sylvius and Rolando.

When we consider physiology we are struck both by its great progress and by its imperfections. The older physiology is obsolete and discarded; but in the newer physiology the functions of some large and important organs are still undetermined. The ductless glands, for instance; the spleen, the thyroid, the thymus, the supra-renal capsules. An ignorance of their functions renders the surgeon unable to predict the consequences of their removal. Of what avail the brilliant operation to excise a double goitre, if it is to be followed by an obscure degeneration of the nervous or glandular systems? Again, in organs of known function, the limit of the digestive power of different portions of the alimentary canal is not yet definitely learned. How can we

get along without a gall-bladder? How important is the pancreas? Can the duodenum supplant the stomach in nutrition? How much ileum can be removed without starvation? What will the rectum digest? All these are pertinent questions for the physiologist, and have a direct bearing on modern surgery.

In chemistry, the whole study of sepsis, antisepsis, fermentation, germicides, the viability of spores, is in its infancy; and as certainly as it already has reversed surgical practice, will do so again and again.

The great desideratum of surgery now, if chemistry can supply it, is a new, constant, local anæsthetic. This would enable us to banish a chief cause of secondary shock from our operations.

Finally, in pathology we have much to learn and to influence our surgical practice. Diseased organs change appearance and they change place. A double puzzle is thus presented to the operator. On opening the abdominal cavity we are sometimes at a loss to locate an organ; and even fail to recognize it, so changed is its look and its surroundings. One part is mistaken for another; a sac for intestine; intestine for sac; adhesions for peritoneum; and so in many other instances. It is of the last importance that the operating surgeon should be so familiar with pathological changes that he can distinguish the false from the true at a glance.

The future destiny of coarse pathological changes of organs: whether they are hopelessly diseased;

whether they can recover; whether the affection is organic or inflammatory; is also to be decided, rightly or wrongly, by the surgical expert on a brief inspection.

Having considered how much we may learn or hope from the pure sciences, we pass to the other limitation of the subject, the arrest or the cure of morbid processes. All surgical disease is inflammatory or organic; we must advance by checking the inflammatory process, or by preventing morbid growths: the first, by averting suppuration; the second, by discovering the causes of cell change and cell proliferation. Through surgical pathology lies the only path. True conservative surgery would then be limited to averting the consequences of traumatism. The earlier labors of Paget, and the later ones of Virchow, Pasteur, and Koch, give us some hope of being able to abort suppuration; to inoculate for tubercle; or to eliminate the cancer cell. The abortion of inflammation is now much advanced by the progressing knowledge of asepsis. Pyæmia, the opprobrium of surgery, has been enormously reduced in frequency. When suppuration has occurred, evacuation, drainage, and antiseptics have been equally successful in shortening the pyogenic process and in promoting repair. In tubercle we see the best results follow the *évidement* of Sedillot, both in cancellous bone and in suppurating lymphatics.

As in variola, may we not hope that a modified germ may jugulate the tubercle bacillus, by inocu-

lation? or if we meet not the success which the modification of rabies is slowly attaining, that chemistry may give us a reagent to devitalize the germ of tuberculosis.

Cancer, to include under that term all recurrent tumors, is, by Virchow's nomenclature, a misplaced cell-growth. Modern research now gives us hope of finding the cause of this mal-development; and if a germ should be discovered here, a germicide will be finally found.

The manual part of our art, chirurgery — hand-craft — requires also to be perfected in connection with the advancing boldness with which we open cavities and feel the pulse of life in its central shrine. New operations demand a new *technique*; new modes; new instruments; a new code of rules; all to be learned by experiment. Nowhere, perhaps, could the French saying, "*jeun chirurgien, vieux médecin*," be more applicable. It is to the young surgeon, born and bred in asepsis, that the older physician must look for progress in our art.

In estimating, then, the limitations of surgery, we find none except they be set by ourselves. How should they be set? By conservative judgment opposed to rashness. In the list of modern and useful operations, as distinguished from those barely justifiable, are the following: —

(1) To remove growths or foreign bodies from the cavities of the body: opening the brain; opening the spinal cord; displacement of the upper jaw or of the nose for naso-pharyngeal polypi; cutting

into the pharynx from outside the neck, to remove tumors of the tonsil; œsophagotomy for foreign bodies; thyrotomy for growths; gastrotomy for foreign bodies; opening the gall-bladder for the removal of stones; opening the pelvis of the kidney for calculi; supra-pubic cystotomy for calculi and tumors of the bladder; ovariotomy; removal of the diseased uterus or its appendages; laparotomy for gun-shot wounds and for extra uterine fœtation; excision of the lower part of the rectum for growths.

(2) To reach and evacuate inflammatory products: opening the chest and resecting the ribs for empyæma; opening the abdomen for appendicitis; or for chronic peritonitis; opening and drainage of pelvic abscesses; of abscess of the vertebræ; opening of deep abscess of the neck; evacuation of and draining abscesses of joints; peri-nephritic abscess and removal of one kidney.

(3) To relieve obstruction: intubation and tracheotomy; gastrotomy and enterostomy; colotomy; perineal section; herniotomy.

(4) To restore continuity: resection and suture of bowel; resection and union of bone; resection and reunion of nerves; nerve grafting; reunion of tendons and of muscles.

(5) Unclassified procedures: plastic and osteoplastic surgery; modifications of orthopedics, including bone sections and excisions; litholapaxy; reduction of dislocation of the hip, and of the shoulder, by applied anatomy; endoscopy;

rhinoscopy and removal of turbinated outgrowths; pathology and removal of adenoids; aseptic wiring of fractures; local anæsthesia in setting fractures; closing of skull wounds by the insertion of buttons of bone.

(6) Operations as yet *sub judice*, or on trial: resection of the pylorus; resection of cancerous intestine or omentum; removal of the spleen; of large bronchoceles; of the larynx; the pancreas; the prostate gland; the normal ovary; fixation of the kidney or of the uterus; puncture of the pericardium; opening gangrenous abscesses in the lung; tapping the ventricles of the brain.

Rash statements are to be discounted; rash operations are to be discouraged. The wisdom of our earliest Greek master in analyzing the imperfections of our art holds true to-day: "Ars longa, vita brevis est; occasio fugax; experientia fallax; judicium difficile." Yet with Bacon came the new light of experiment. In his immortal words: "Recte veritas temporis filia dicitur, non auctoritatis." Lean not on authority: the test of truth is time.